

**FAIRCHILD**

A Schlumberger Company

**1N4009/FDLL4009**

Ultra High Speed Diodes

T.03.09

- $t_{rr}$ ... 2 ns (MAX)
- BV... 35 V (MIN) @ 5  $\mu$ A

**PACKAGES**

1N4009	DO-35
FDLL4009	LL-34

**ABSOLUTE MAXIMUM RATINGS (Note 1)****Temperatures**

Storage Temperature Range	-65°C to +200°C
Maximum Junction Operating Temperature	+175°C
Lead Temperature	+260°C

If you need this device in the SOT package, an electrical equivalent is available. See FDSO1200 family.

**Power Dissipation (Note 2)**

Maximum Total Power Dissipation at 25°C Ambient	500 mW
Linear Power Derating Factor	3.33 mW/°C

**Maximum Voltage and Current**

WIV	Working Inverse Voltage	25 V
$I_O$	Average Rectified Current	100 mA
$I_F$	Continuous Forward Current	300 mA
$i_f$	Peak Repetitive Forward Current	400 mA
$i_f$ (surge)	Peak Forward Surge Current	
	Pulse Width = 1 s	1.0 A
	Pulse Width = 1 $\mu$ s	4.0 A

**ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)**

SYMBOL	CHARACTERISTIC	MIN	MAX	UNITS	TEST CONDITIONS
$V_F$	Forward Voltage		1.0	V	$I_F = 30$ mA
$I_R$	Reverse Current		0.1 100	$\mu$ A $\mu$ A	$V_R = 25$ V $V_R = 25$ V, $T_A = 150^\circ$ C
BV	Breakdown Voltage	35		V	$I_R = 5.0$ $\mu$ A
$t_{rr}$	Reverse Recovery Time		4.0 2.0	ns ns	$I_f = I_r = 10$ mA (Note 3) $I_f = 10$ mA, $V_r = 6.0$ V, $R_L = 100$ $\Omega$
C	Capacitance		4.0	pF	$V_R = 0$ , $f = 1.0$ MHz

**NOTES:**

1. These ratings are limiting values above which the serviceability of the diode may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty-cycle operation.
3. Recovery to 1.0 mA.
4. For product family characteristic curves, refer to Chapter 4, D4.



**1N/FDLL4151/4152**  
**1N/FDLL4153/4154**  
 High Speed Diodes

T.03-09

- C... 4 pF (MAX)
- t<sub>rr</sub>... 2 nS (MAX) @ 10 mA, -6 V, 100 Ω

**ABSOLUTE MAXIMUM RATINGS (Note 1)**

<b>Temperatures</b>		
Storage Temperature Range		-65°C to +200°C
Maximum Junction Operating Temperature		+175°C
Lead Temperature		+260°C

<b>Power Dissipation (Note 2)</b>		
Maximum Total Power Dissipation at 25°C Ambient		500 mW
Linear Power Derating Factor		3.33 mW/°C

<b>Maximum Voltage and Currents</b>			
WIV	Working Inverse Voltage	1N4151 50 V 1N4152 30 V	1N4153 50 V 1N4154 25 V
I <sub>O</sub>	Average Rectified Current		100 mA
I <sub>F</sub>	Continuous Forward Current		300 mA
I <sub>F</sub>	Peak Repetitive Forward Current		400 mA
i <sub>F</sub> (surge)	Peak Forward Surge Current		
	Pulse Width = 1 s		1.0 A
	Pulse Width = 1 μs		4.0 A

**PACKAGES**

1N4151	DO-35
1N4152	DO-35
1N4153	DO-35
1N4154	DO-35
FDLL4151	LL-34
FDLL4152	LL-34
FDLL4153	LL-34
FDLL4154	LL-34

If you need this device in the SOT package, an electrical equivalent is available. See FDSO1200 family.

**ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)**

SYMBOL	CHARACTERISTIC	MIN	MAX	UNITS	TEST CONDITIONS	
V <sub>F</sub>	Forward Voltage	1N4154	1.0	V	I <sub>F</sub> = 30 mA	
		1N4151	1.0	V	I <sub>F</sub> = 50 mA	
		1N4152 & 1N4153	0.49	0.55	V	I <sub>F</sub> = 0.1 mA
			0.53	0.59	V	I <sub>F</sub> = 0.25 mA
			0.59	0.67	V	I <sub>F</sub> = 1.0 mA
			0.62	0.70	V	I <sub>F</sub> = 2.0 mA
			0.70	0.81	V	I <sub>F</sub> = 10 mA
			0.74	0.88	V	I <sub>F</sub> = 20 mA
I <sub>R</sub>	Reverse Current	1N4154	0.1	μA	V <sub>R</sub> = 25 V	
		1N4153 } 1N4151 }	100	μA	V <sub>R</sub> = 25 V, T <sub>A</sub> = 150°C	
			0.05	μA	V <sub>R</sub> = 60 V	
		1N4152	50	μA	V <sub>R</sub> = 60 V, T <sub>A</sub> = 150°C	
			0.05	μA	V <sub>R</sub> = 30 V	
	50	μA	V <sub>R</sub> = 30 V, T <sub>A</sub> = 150°C			
BV	Breakdown Voltage	1N4154	35	V	I <sub>R</sub> = 5.0 μA	
		1N4153 } 1N4151 }	75	V	I <sub>R</sub> = 5.0 μA	
		1N4152		V	I <sub>R</sub> = 5.0 μA	
			40	V	I <sub>R</sub> = 5.0 μA	
t <sub>rr</sub>	Reverse Recovery Time		4.0	ns	I <sub>F</sub> = 10 mA, I <sub>R</sub> = 10 mA (Note 3)	
			2.0	ns	I <sub>F</sub> = 10 mA V <sub>R</sub> = -6.0 V, R <sub>L</sub> = 100 Ω	
C	Capacitance		4.0	pF	V <sub>R</sub> = 0, f = 1.0 MHz	

**NOTES:**

1. The maximum ratings are limiting values above which satisfactory performance may be impaired.
2. These are steady state limits. The factory should be consulted in applications involving pulsed or low duty cycle operation.
3. Recovery to 1.0 mA.
4. For product family characteristic curves, refer to Chapter 4, D4.

**FAIRCHILD**

A Schlumberger Company

**1N4728 through 1N4752**

1 W Silicon Zener Diodes T-11-13

**ABSOLUTE MAXIMUM RATINGS (Note 1)****Temperatures**

Storage Temperature Range	-65°C to +200°C
Maximum Junction Operating Temperature	+200°C
Lead Temperature	+260°C

**Power Dissipation (Note 2)**

Maximum Total Dissipation at 50°C Ambient	1 W
Linear Power Derating Factor (from 50°C)	6.67 mW/°C
Maximum Surge Power (Note 8)	10 W

**PACKAGES**

All Devices DO-41

**ELECTRICAL CHARACTERISTICS (25°C Ambient)**

SYMBOL	V <sub>Z</sub>	Z <sub>Z</sub>	I <sub>ZT</sub>	Z <sub>ZK</sub>	I <sub>ZK</sub>	I <sub>R</sub>	V <sub>RT</sub>	I <sub>ZM</sub>	I <sub>Z</sub> (surge)
Characteristic	Nominal Zener Voltage (Note 4) @I <sub>ZT</sub>	Maximum Zener Impedance (Note 5) @I <sub>ZT</sub>	Test Current	Maximum Zener Knee Impedance (Note 5) @I <sub>ZK</sub>	Test Current	Maximum Reverse Current @V <sub>RT</sub>	Test Voltage	Maximum Zener Current (Note 6)	Maximum Zener Surge Current (Note 3)
UNIT	V	Ω	mA	Ω	mA	μA	V	mA	mA
1N4728	3.3	10.0	76.0	400	1.0	100	1.0	276	1380
1N4729	3.6	10.0	69.0	400	1.0	100	1.0	252	1260
1N4730	3.9	9.0	64.0	400	1.0	50	1.0	234	1190
1N4731	4.3	9.0	58.0	400	1.0	10	1.0	217	1070
1N4732	4.7	8.0	53.0	500	1.0	10	1.0	193	970
1N4733	5.1	7.0	49.0	550	1.0	10	1.0	178	890
1N4734	5.6	5.0	45.0	600	1.0	10	2.0	162	810
1N4735	6.2	2.0	41.0	700	1.0	10	3.0	146	730
1N4736	6.8	3.5	37.0	700	1.0	10	4.0	133	660
1N4737	7.5	4.0	34.0	700	0.5	10	6.0	121	605
1N4738	8.2	4.5	31.0	700	0.5	10	6.0	110	550
1N4739	9.1	5.0	28.0	700	0.5	10	7.0	100	500
1N4740	10.0	7.0	25.0	700	0.25	10	7.6	91	454

**NOTES**

- These ratings are limiting values above which the serviceability of the diode may be impaired.
- These are steady state limits. The factory should be consulted on applications involving pulsed or low duty-cycle operation.
- Non-recurrent square wave, PW = 8.3 ms, superimposed on Zener test current, I<sub>ZT</sub>.
- Type numbers without suffix have ± 10% tolerance on nominal V<sub>Z</sub>. Type numbers with suffix A have ± 5% tolerance on nominal V<sub>Z</sub>.
- The Zener impedances Z<sub>Z</sub> and Z<sub>ZK</sub> are derived by superimposing a 60 Hz signal on test currents I<sub>ZT</sub> and I<sub>ZK</sub>, having an RMS value of 10% of the d.c. value of I<sub>ZT</sub> and I<sub>ZK</sub> respectively.
- Maximum Zener Current (I<sub>ZM</sub>) is based on the maximum Zener voltage of a 10% tolerance unit.
- V<sub>F</sub> = 1.2 V (max) @ I<sub>F</sub> = 200 mA for all types. Non-recurrent square wave, PW = 8.3 ms, T<sub>A</sub> = 55°C.
- Non-recurrent square wave, PW = 8.3 ms, T<sub>A</sub> = 55°C.
- For product family characteristic curves, refer to Chapter 4, D14.

## 1N4728 through 1N4752

T-11-13

## ELECTRICAL CHARACTERISTICS (25°C Ambient)

SYMBOL	V <sub>Z</sub>	Z <sub>Z</sub>	I <sub>ZT</sub>	Z <sub>ZK</sub>	I <sub>ZK</sub>	I <sub>R</sub>	V <sub>RT</sub>	I <sub>ZM</sub>	i <sub>Z</sub> (surge)
Characteristic	Nominal Zener Voltage (Note 4) @I <sub>ZT</sub>	Maximum Zener Impedance (Note 5) @I <sub>ZT</sub>	Test Current	Maximum Zener Knee Impedance (Note 5) @I <sub>ZK</sub>	Test Current	Maximum Reverse Current @V <sub>RT</sub>	Test Voltage	Maximum Zener Current (Note 6)	Maximum Zener Surge Current (Note 3)
UNIT	V	Ω	mA	Ω	mA	μA	V	mA	mA
1N4741	11.0	8.0	23.0	700	0.25	5.0	8.4	83	414
1N4742	12.0	9.0	21.0	700	0.25	5.0	9.1	78	380
1N4743	13.0	10.0	19.0	700	0.25	5.0	9.9	69	344
1N4744	15.0	14.0	17.0	700	0.25	5.0	11.4	61	304
1N4745	16.0	16.0	15.5	700	0.25	5.0	12.2	57	285
1N4746	18.0	20.0	14.0	750	0.25	5.0	13.7	50	250
1N4747	20.0	22.0	12.5	750	0.25	5.0	15.2	45	225
1N4748	22.0	23.0	11.5	750	0.25	5.0	16.7	41	205
1N4749	24.0	25.0	10.5	750	0.25	5.0	18.2	38	190
1N4750	27.0	35.0	9.5	750	0.25	5.0	20.6	34	170
1N4751	30.0	40.0	8.5	1000	0.25	5.0	22.8	30	150
1N4752	33.0	45.0	7.5	1000	0.25	5.0	25.1	27	135

**FAIRCHILD**

A Schlumberger Company

**1N5226 through 1N5257**  
500 mW Silicon Zener Diodes

T-11-13

**ABSOLUTE MAXIMUM RATINGS (Note 1)**

**Temperatures**

Storage Temperature Range	-65°C to +200°C
Maximum Junction Operating Temperature	+200°C
Lead Temperature	+260°C

**Power Dissipation (Note 2)**

Maximum Total Power Dissipation at 75°C Ambient	500 mW
Linear Power Derating Factor (from 75°C)	4.0 mW/°C
Maximum Surge Power (Note 3)	10 W

**PACKAGES**

All Devices DO-35

**ELECTRICAL CHARACTERISTICS (25°C Ambient unless otherwise noted)**

SYMBOL	V <sub>Z</sub>		Z <sub>Z</sub>	I <sub>ZT</sub>	Z <sub>ZK</sub>	I <sub>R</sub>		V <sub>RT</sub>		TC
	Nominal Zener Voltage (Note 4) @I <sub>ZT</sub>	Maximum Zener Impedance (Note 5) @I <sub>ZT</sub>	Test Current	Maximum Zener Knee Impedance (Note 5) @I <sub>ZK</sub> = 0.25 mA	Maximum Reverse Current @ V <sub>RT</sub>		Test Voltage		Maximum Temperature Coefficient of V <sub>Z</sub> (Note 6)	
					±20% V <sub>Z</sub> Tolerance	±10, 5, 2, 1% V <sub>Z</sub> Tolerance	±20, 10% V <sub>Z</sub> Tolerance	±5, 2, 1% V <sub>Z</sub> Tolerance		
UNIT	V	Ω	mA	Ω	μA	μA	V	V	%/°C	
1N5226	3.3	28	20	1600	100	25	0.95	1.0	-0.070	
1N5227	3.6	24	20	1700	100	15	0.95	1.0	-0.065	
1N5228	3.9	23	20	1900	75	10	0.95	1.0	-0.060	
1N5229	4.3	22	20	2000	50	5.0	0.95	1.0	±0.055	
1N5230	4.7	19	20	1900	50	5.0	1.9	2.0	±0.030	
1N5231	5.1	17	20	1600	50	5.0	1.9	2.0	±0.030	
1N5232	5.6	11	20	1600	50	5.0	2.9	3.0	+0.038	
1N5233	6.0	7.0	20	1600	50	5.0	3.3	3.5	+0.038	
1N5234	6.2	7.0	20	1000	50	5.0	3.8	4.0	+0.045	
1N5235	6.8	5.0	20	750	30	3.0	4.8	5.0	+0.050	
1N5236	7.5	6.0	20	500	30	3.0	5.7	6.0	+0.058	
1N5237	8.2	8.0	20	500	30	3.0	6.2	6.5	+0.062	
1N5238	8.7	8.0	20	600	30	3.0	6.2	6.5	+0.065	
1N5239	9.1	10	20	600	30	3.0	6.7	7.0	+0.068	
1N5240	10.0	17	20	600	30	3.0	7.6	8.0	+0.075	
1N5241	11.0	22	20	600	30	2.0	8.0	8.4	+0.076	

**NOTES:**

- These ratings are limiting values above which the serviceability of the diode may be impaired.
- These are steady state limits. The factory should be consulted on applications involving pulsed or low duty-cycle operation.
- Non-recurrent square wave, PW = 8.3 ms, T<sub>R</sub> = 55°C.
- Type numbers without suffix have ±20% tolerance on nominal V<sub>Z</sub>.  
Type numbers with suffix A have ±10% tolerance on nominal V<sub>Z</sub>.  
Type numbers with suffix B have ±5% tolerance on nominal V<sub>Z</sub>.  
Type numbers with suffix C have ±2% tolerance on nominal V<sub>Z</sub>.  
Type numbers with suffix D have ±1% tolerance on nominal V<sub>Z</sub>.
- The Zener impedances Z<sub>Z</sub> and Z<sub>ZK</sub> are derived by superimposing a 60 Hz signal on test currents I<sub>ZT</sub> and I<sub>ZK</sub>, having an RMS value of 10% of the d.c. value of I<sub>ZT</sub> and I<sub>ZK</sub> respectively.
- Maximum temperature coefficients apply to 10, 5, 2 and 1% tolerance types only and are measured under the following conditions:  
1N5226A, B, C, D through 1N5242A, B, C, D: I<sub>Z</sub> = 7.5 mA, T<sub>1</sub> = 25°C, T<sub>2</sub> = 125°C.  
1N5242A, B, C, D through 1N5257A, B, C, D: I<sub>Z</sub> = I<sub>ZT</sub>, T<sub>1</sub> = 25°C, T<sub>2</sub> = 125°C.
- V<sub>F</sub> = 1.1V (maximum) @ I<sub>F</sub> = 200 mA for all types.
- For product family characteristic curves, refer to Chapter 4, D13.

## 1N5226 through 1N5257

T-11-13

## ELECTRICAL CHARACTERISTICS (25°C Ambient unless otherwise noted)

SYMBOL	V <sub>Z</sub>		I <sub>ZT</sub>	Z <sub>ZK</sub>	I <sub>R</sub>		V <sub>RT</sub>		TC		
	Nominal Zener Voltage (Note 4) @I <sub>ZT</sub>	Maximum Zener Impedance (Note 5) @I <sub>ZT</sub>			Test Current	Maximum Zener Knee Impedance (Note 5) @I <sub>ZK</sub> = 0.25 mA	Maximum Reverse Current @ V <sub>RT</sub>			Test Voltage	
							±20% V <sub>Z</sub> Tolerance	±10, 5, 2, 1% V <sub>Z</sub> Tolerance		±20, 10% V <sub>Z</sub> Tolerance	±5, 2, 1% V <sub>Z</sub> Tolerance
UNIT	V	Ω	mA	Ω	μA	μA	V	V	%/°C		
1N5242	12.0	30	20	600	10	1.0	8.7	9.1	+0.077		
1N5243	13.0	13	9.5	600	10	0.5	9.4	9.9	+0.079		
1N5244	14.0	15	9.0	600	10	0.1	9.5	10.0	+0.082		
1N5245	15.0	16	8.5	600	10	0.1	10.5	11.0	+0.082		
1N5246	16.0	17	7.8	600	10	0.1	11.4	12.0	+0.083		
1N5247	17.0	19	7.4	600	10	0.1	12.4	13.0	+0.084		
1N5248	18.0	21	7.0	600	10	0.1	13.3	14.0	+0.085		
1N5249	19.0	23	6.6	600	10	0.1	13.3	14.0	+0.086		
1N5250	20.0	25	6.2	600	10	0.1	14.3	15.0	+0.086		
1N5251	22.0	29	5.6	600	10	0.1	16.2	17.0	+0.087		
1N5252	24.0	33	5.2	600	10	0.1	17.1	18.0	+0.088		
1N5253	25.0	35	5.0	600	10	0.1	18.1	19.0	+0.089		
1N5254	27.0	41	4.6	600	10	0.1	20.0	21.0	+0.090		
1N5255	28.0	44	4.5	600	10	0.1	20.0	21.0	+0.091		
1N5256	30.0	49	4.2	600	10	0.1	22.0	23.0	+0.091		
1N5257	33.0	58	3.8	700	10	0.1	24.0	25.0	+0.092		

3469674 FAIRCHILD SEMICONDUCTOR

84D 27495 D'

**FAIRCHILD**

A Schlumberger Company

**1N5282**

7-03-09

High Conductance  
Ultra Fast Diodes

- BV...80 V (MIN) @ 5.0  $\mu$ A
- C...2.5 pF @  $V_R = 0$  V,  $f = 1.0$  MHz
- $t_{rr}$ ...4.0 ns @  $I_f = I_r = 10$  mA to 200 mA

**PACKAGES**

1N5282

DO-35

**ABSOLUTE MAXIMUM RATINGS (Note 1)****Temperatures**

Storage Temperature Range	-65°C to +200°C
Maximum Junction Operating Temperature	+175°C
Lead Temperature	+260°C

**Power Dissipation (Note 2)**

Maximum Total Dissipation at 25° Ambient	500 mW
Linear Derating Factor (from 25°C)	3.33 mW/°C

**Maximum Voltage and Currents**

WIV	Working Inverse Voltage	55 V
$I_O$	Average Rectified Current	200 mA
$I_F$	Continuous Forward Current	300 mA
$i_f(\text{surge})$	Peak Forward Surge Current	
	Pulse Width = 1.0 s	1.0 A
	Pulse Width = 1.0 $\mu$ s	4.0 A

**ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)**

SYMBOL	CHARACTERISTIC	MIN	MAX	UNITS	TEST CONDITIONS
$V_F$	Forward Voltage	1.05	1.30	V	$I_F = 500$ mA
		0.92	1.10	V	$I_F = 300$ mA
		0.80	0.90	V	$I_F = 100$ mA
		0.67	0.725	V	$I_F = 10$ mA
		0.55	0.60	V	$I_F = 1.0$ mA
		0.45	0.49	V	$I_F = 0.1$ mA
$I_R$	Reverse Current		100	nA	$V_R = 55$ V
			100	$\mu$ A	$V_R = 55$ V, $T_A = 150^\circ\text{C}$
BV	Breakdown Voltage	80		V	$I_R = 5.0$ $\mu$ A
$t_{rr}$	Reverse Recovery Time (Note 3)		4.0	ns	$I_f = I_r = 10$ mA to 200 mA $R_L = 100$ $\Omega$
$t_{rr}$	Reverse Recovery Time		2.0	ns	$I_f = 10$ mA, $V_r = 6.0$ V
$t_{fr}$	Forward Recovery Time		10	ns	$I_f = 200$ mA (Note 4)
$V_{pk}$	Peak Forward Voltage		2.0	V	$I_f = 500$ mA (Note 5)
C	Capacitance		2.5	pF	$V_R = 0$ , $f = 1.0$ MHz

**NOTES.**

- The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
- These are steady-state limits. The factory should be consulted on applications involving pulsed or low duty-cycle operation.
- Recovery to 0.1  $I_r$ .
- $I_f = 0.4$  ns,  $V_{fr} = 1.0$  V, pulse width = 100 ns; duty cycle  $\leq 1\%$ .
- $I_f = 8.0$  ns, pulse width = 1.0  $\mu$ s; duty cycle  $\leq 1\%$ .
- For product family characteristics curves, refer to Chapter 4, D4.



**1S920/921/922/923**  
**FDLL920/921/922/923**  
 General Purpose Diodes

T-01-09

- $V_F \dots 1.2$  (MAX) @ 200 mA
- $I_R \dots 100$  nA (MAX) @ RATED WIV

**ABSOLUTE MAXIMUM RATINGS (Note 1)**

**Temperatures**

Storage Temperature Range	-65°C to +200°C
Maximum Junction Operating Temperature	+175°C
Lead Temperature	+260°C

**Power Dissipation (Note 2)**

Maximum Total Dissipation at 25°C Ambient	500 mW
Linear Derating Factor (from 25°C)	3.33 mW/°C

**Maximum Voltage and Currents**

		1S920	1S921	1S922	1S923
WIV	Working Inverse Voltage (-65°C to +100°C)	50 V	100 V	150 V	200 V
$I_O$	Average Forward Current	200 mA	200 mA	200 mA	200 mA
$I_f$	Recurent Peak Forward Current	600 mA	600 mA	600 mA	600 mA
$I_f$ (surge)	Peak Forward Surge Current				
	Pulse Width = 1 s	1.0 A	1.0 A	1.0 A	1.0 A
	Pulse Width = 1 $\mu$ s	4.0 A	4.0 A	4.0 A	4.0 A

**PACKAGES**

1S920	DO-35
1S921	DO-35
1S922	DO-35
1S923	DO-35
FDLL920	LL-34
FDLL921	LL-34
FDLL922	LL-34
FDLL923	LL-34

If you need this device in the SOT package, an electrical equivalent is available. See FDSO1400 family.

**ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)**

SYMBOL	CHARACTERISTIC	MIN	MAX	UNITS	TEST CONDITIONS
$I_R$	Inverse Current		100 10	nA $\mu$ A	$V_R$ = rated WIV $V_R$ = rated WIV, $T_A$ = 100°C
$V_F$	Forward Voltage		1.2	V	$I_F$ = 200 mA
C	Capacitance		6.5	pF	$V_R$ = 0, f = 1 MHz
Qs	Stored Charge		12	nC	$I_F$ = 10 mA, $V_R$ = 10 V

**NOTES:**

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty-cycle operation.
3. For product family characteristic curves, refer to Chapter 4, D1.



3469674 FAIRCHILD SEMICONDUCTOR

84D 27502 D.

**FAIRCHILD**

A Schlumberger Company

**2N/MPS/FTSO706** T-35-23  
**MPS/FTSO706A**

NPN High Speed Logic Switches

- $V_{CEr}$  ... 20 V (Min) @ 10 mA
- $h_{FE}$  ... 20 (Min) @ 10 mA
- $T_B$  ... 60 ns (Max) 2N/MPS/FTSO706), 25 ns (Max) (MPS/FTSO706A)
- Complements ... MPS3640 (TO-92)

**PACKAGE**

2N706	TO-118A
MPS706	TO-92
MPS706A	TO-92
FTSO706	TO-236AA/AB
FTSO706A	TO-236AA/AB

**ABSOLUTE MAXIMUM RATINGS** (Note 1)

Temperatures	2N	MPS/FTSO
Storage Temperature	-65° C to 175° C	-55° C to 150° C
Operating Junction Temperature	175° C	150° C

**Power Dissipation** (Notes 2 & 3)

Total Dissipation at	2N	MPS	FTSO
25° C Ambient Temperature	0.3 mW	0.625 W	0.350 W*
25° C Case Temperature	1.0 W	1.0 W	

**Voltages & Currents**

	706	706A
$V_{CBO}$ Collector to Base Voltage	25 V	25V
$V_{CEr}$ Collector to Emitter Voltage ( $R_{BE} \leq 10 \Omega$ ) (Note 4)	20 V	20 V
$V_{EBO}$ Emitter to Base Voltage	3.0 V	5.0 V

**Electrical Characteristics** (25° C Ambient Temperature unless otherwise noted) (Note 6)

SYMBOL	CHARACTERISTIC	MPS706		706A		UNITS	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
$BV_{CEO}$	Collector to Emitter Breakdown Voltage	15		15		V	$I_C = 10 \text{ mA}$ , $I_B = 0$
$BV_{CEr}$	Collector to Emitter Breakdown Voltage	20		20		V	$I_C = 10 \text{ mA}$ , $R_{BE} = 10 \Omega$
$BV_{CBO}$	Collector to Base Breakdown Voltage	25		25		V	$I_C = 10 \mu\text{A}$ , $I_E = 0$
$I_{EBO}$	Emitter Cutoff Current		10		10	$\mu\text{A}$	$V_{EB} = 3.0 \text{ V}$ , $I_C = 0$
$I_{CBO}$	Collector Cutoff Current		500		500	nA	$V_{CB} = 15 \text{ V}$ , $I_E = 0$
$h_{FE}$	DC Current Gain (Note 5)	20		20	60		$I_C = 10 \text{ mA}$ , $V_{CE} = 1.0 \text{ V}$

**NOTES:**

- These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
  - These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
  - These ratings give a maximum junction temperature of 175° C and junction-to-case thermal resistance of 150° C/W (derating factor of 6.7 mW/°C) for 2N706. These ratings give a maximum junction temperature of 150° C and (TO-92) junction-to-case thermal resistance of 125° C/W (derating factor of 8.0 mW/°C), junction-to-ambient thermal resistance of 200° C/W (derating factor of 5.0 mW/°C) for MPS706 and MPS706A; (TO-236) junction-to-ambient thermal resistance of 357° C/W (derating factor of 2.8 mW/°C).
  - Rating refers to a high current point where collector to emitter voltage is lowest.
  - Pulse conditions: length  $\leq 12 \mu\text{s}$ ; duty cycle = 1% for MPS706, MPS706A; length = 300 $\mu\text{s}$ ; duty cycle = 1% for 2N706.
  - For product family characteristic curves, refer to Curve Set T132 for 2N706; T162 for MPS706 and MPS706A.
- \* Package mounted on 99.5% alumina 8 mm x 8 mm x 0.6 mm.

3469674 FAIRCHILD SEMICONDUCTOR

84D 27503 D.

2N/MPS/FTSO706  
MPS/FTSO706A T-35-23

**ELECTRICAL CHARACTERISTICS** (25° C Ambient Temperature unless otherwise noted) (Note 6)

SYMBOL	CHARACTERISTIC	MPS706		706A		UNITS	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.6		0.6	V	$I_C = 10 \text{ mA}$ , $I_B = 1.0 \text{ mA}$
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)		0.9	0.7	0.9	V	$I_C = 10 \text{ mA}$ , $I_B = 1.0 \text{ mA}$
$C_{ob}$	Output Capacitance		6.0		6.0	pF	$V_{CB} = 10 \text{ V}$ , $I_E = 0$ , $f = 100 \text{ kHz}$
$h_{fe}$	High Frequency Current Gain	2.0		2.0			$I_C = 10 \text{ mA}$ , $V_{CE} = 15 \text{ V}$ , $f = 100 \text{ MHz}$
$r_b'$	Base Resistance		50		50	$\Omega$	$I_E = 10 \text{ mA}$ , $V_{CE} = 15 \text{ V}$ , $f = 300 \text{ MHz}$
$\tau_s$	Charge Storage Time Constant (test circuit no. 3111)		60		25	ns	$I_C = 10 \text{ mA}$ , $V_{CC} = 10 \text{ V}$ , $I_{B1} = I_{B2} = 10 \text{ mA}$
$t_{on}$	Turn On Time (test circuit no. 589)		40		40	ns	$I_C = 10 \text{ mA}$ , $I_{B1} = 3.0 \text{ mA}$ , $V_{CC} = 3.0 \text{ V}$
$t_{off}$	Turn Off Time (test circuit no. 589)		75		75	ns	$I_C = 10 \text{ mA}$ , $I_{B1} = 3.0 \text{ mA}$ , $I_{B2} = 1.5 \text{ mA}$ , $V_{CC} = 3.0 \text{ V}$

SYMBOL	CHARACTERISTIC	2N706		UNITS	TEST CONDITIONS
		MIN	MAX		
$BV_{CER}$	Collector to Emitter Breakdown Voltage	20		V	$I_C = 10 \text{ mA}$ , $R_{BE} = 10 \Omega$
$BV_{CBO}$	Collector to Base Breakdown Voltage	25		V	$I_C = 10 \mu\text{A}$ , $I_E = 0$
$I_{CBO}$	Collector Cutoff Current		300	nA	$V_{CB} = 15 \text{ V}$ , $I_E = 0$
$h_{FE}$	DC Current Gain (Note 5)	20			$I_C = 10 \text{ mA}$ , $V_{CE} = 1.0 \text{ V}$
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.6	V	$I_C = 10 \text{ mA}$ , $I_B = 1.0 \text{ mA}$
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)		0.6	V	$I_C = 10 \text{ mA}$ , $I_B = 1.0 \text{ mA}$
$C_{ob}$	Output Capacitance		6.0	pF	$V_{CB} = 10 \text{ V}$ , $I_E = 0$ , $f = 100 \text{ kHz}$
$h_{fe}$	High Frequency Current Gain	2.0			$I_C = 10 \text{ mA}$ , $V_{CE} = 15 \text{ V}$ , $f = 100 \text{ MHz}$
$\tau_s$	Charge Storage Time Constant (test circuit no. 3111)		60	ns	$I_C = 10 \text{ mA}$ , $V_{CC} = 10 \text{ V}$ , $I_{B1} = I_{B2} = 10 \text{ mA}$